

REMARKS

By this amendment, Applicants have amended the claims to further define their invention. In particular, claim 1 has been amended to include therein the limitations previously recited in claims 4 and 7. Claim 8 has been amended to be in independent form by including therein the limitations previously recited in claims 1, 4 and 7. Claims 1 and 8 have been amended to recite the speaker diaphragm is molded from the mixture. See, e.g., paragraph 0007 of Applicants' specification. Applicants have canceled claims 4, 7, 9-13 and 15-20 without prejudice or disclaimer and have amended claim 14 to depend from claim 8. Applicants have also added new claims 21-33 to define further aspects of the present invention. Claims 21-23 correspond to claims 2, 3 and 5, respectively, but depend from claim 8. Claims 24 and 29 are supported by, e.g., paragraph 0001 of Applicants' specification. Claims 25-27 and 30-32 are supported by, e.g., paragraph 0009 of Applicants' specification. Claims 28 and 33 are supported by, e.g., paragraph 0013 of Applicants' specification.

Claims 1-20 stand rejected under 35 U.S.C. 103(a) as being obvious over either U.S. Patent No. 5,274,119 to Uryu et al. or U.S. Patent No. 4,518,642 to Johnston et al. in view of WO 2004/054315 A1 to Ishida et al., the Examiner relying on U.S. Patent Application Publication No. 2006/0225950 A1 as an English equivalent of Ishida et al. Applicants traverse this rejection and request reconsideration thereof.

The present invention relates to a speaker diaphragm. According to the present invention, the diaphragm is molded from a mixture including a

non-chlorinated synthetic resin and a powdery cellulose material whose particle size falls within a range of from 5 μm to 500 μm . In order to enhance the affinity of the powdery cellulose material to the non-chlorinated synthetic resin, the powdery cellulose material in the mixture has been subjected to an esterification surface treatment using an anhydride of a polybasic acid. The speaker diaphragm is made by molding such a mixture. As set forth in claim 8, the mixture can also include an inorganic peroxide. Such a speaker diaphragm is not disclosed or rendered obvious by any of the cited documents or even a combination thereof.

The Uryu et al. patent discloses that an acoustic diaphragm is obtained by forming micro-fibrillated cellulose into a web by a process similar to a paper-making process. The micro-fibrillated cellulose is the cellulose obtained by beating to the Canadian standard freeness of not more than 300 ml, or bacterial cellulose. Since the micro-fibrillated cellulose is poor in wet strength, it is reinforced by a reinforcement element and, in this state, is formed into the web on a wire screen. The reinforcement element may be detached after forming the web, or may be left laminated with the cellulose web so that the resulting composite product is used as the acoustic diaphragm.

This patent also discloses that, for forming the web, high-polymer fibers such as carbon fibers, glass fibers, aramide fibers, polyolefin fibers, ultra-drawn polyolefin resins or polyester resins may be mixed as reinforcements into the micro-fibrillated cellulose.

As recognized by the Examiner, this patent does not disclose the speaker diaphragm of the present invention since it does not disclose a

speaker diaphragm made from the mixture set forth in claim 1 or 8. For example, the Uryu et al. patent does not disclose a speaker diaphragm molded from a mixture comprising a non-chlorinated synthetic resin and powdery cellulose material whose particle size falls within a range of 5 μm to 500 μm . Such a particle size is not disclosed for the micro-fibrillate cellulose in Uryu et al. Nor is there any disclosure in Uryu et al. that the cellulose material should be subjected to an esterification surface treatment using an anhydride of a polybasic acid to enhance its infinity to a non-chlorinated synthetic resin.

The Johnston et al. patent discloses a loudspeaker diaphragm is formed of a slurry of cellulose fibers and polypropylene fibers. In the fabrication of the diaphragm, a felt is made of the slurry, and the felt is subjected to sufficient heat and pressure to fuse the polypropylene fibers together to form a skeleton or matrix which extends through the felt.

It is disclosed that the ratio thermoplastic fibers to paper-making fibers can be varied broadly, at least within the range of 10% to 50% thermoplastic fiber (dry weight) to paper-making fiber (dry weight), the preferred ratio of the dry weight of the polypropylene fibers to the dry weight of the paper-making fibers being in the range of 0.2 to 0.3.

As recognized by the Examiner, the Johnston et al. patent also does not disclose the speaker diaphragm of the present invention, molded from the mixture set forth in claim 1 or claim 8.

Like the Uryu et al. patent, the Johnston et al. patent does not disclose a speaker diaphragm molded from a mixture comprising a non-chlorinated

synthetic resin and powdery cellulose material whose particle size falls within a range of from 5 μm to 500 μm . Such a particle size is not disclosed in Johnston et al. Nor does the Johnston et al. patent disclose that the cellulose material should be subjected to an esterification surface treatment using an anhydride of a polybasic acid to enhance its affinity to a non-chlorinated synthetic resin.

Thus, the Johnston et al. patent, like the Uryu et al. patent does not disclose and would not have rendered obvious the presently claimed speaker diaphragm.

The Ishida et al. publication discloses a smaller-sized speaker cabinet made of a mixture that is composed of a woody cellulose powder of proper physical properties and a synthetic resin blended with this powder. The resin is a non-chlorinated resin, and the cellulose powder consists of particles whose diameters are included in a range from about 5 μm to 500 μm . The cellulose powder is surface-treated to increase affinity for the resin, so that efficient manufacture of the cabinets of improved acoustic performance is now possible.

Without admitting that the Ishida et al. publication is prior art, it is noted that while the mixture described therein comprises a chlorine-free synthetic resin and cellulosic powder having a particle size distribution of 5 μm to 500 μm , the cellulosic powder having been surface-treated in order to impart an affinity to the synthetic resin, the mixture is used to form a speaker cabinet. Nothing is mentioned in Ishida et al. about using the mixture for molding a speaker diaphragm. Moreover, nothing in Uryu et al. or Johnston et al. would

have provided any reason for using the mixture described in Ishida et al., which is used for a speaker cabinet, as a mixture for molding a speaker diaphragm.

According, it is submitted the presently claimed invention is patentable over the proposed combination of documents.

Applicants request that the Ishida et al. publications (WO 2004/054315 and U.S. 2006/0225950 A1) be listed by the Examiner on a notice of references cited (form PTO-892).

In view of the foregoing amendments and remarks, favorable reconsideration and allowance of all the claims now in the application are requested.

Please charge any shortage in the fees due in connection with the filing of this paper, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 1343.46160X00), and please credit any excess fees to such deposit account.

Respectfully submitted,

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